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THIS ISSUE CONTAINS:
HS-010 459 - HS-010 503
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INTRODUCTION

Publications such as journal articles, proceedings, and research reports announced in *Highway Safety Literature* include some of the most recent additions to the collection of the NHTSA Scientific & Technical Information Service. Subject areas covered include all phases of highway, motor vehicle, and traffic safety, especially those encompassed by the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966.

Individual issues of *HSL* are numbered according to the year and the issue number within that year; thus, 72 designates the year and 1, 2, 3, etc. the individual issues. To aid the user in locating citations by the HS-number, the cover bears the inclusive entry number for each issue.

Entries in *HSL* are arranged according to the NHTSA Subject Category List shown in the Table of Contents. The list is a two-level arrangement consisting of five major subject fields subdivided into 59 subject groups. Documents related directly to the National Highway Traffic Safety Administration

(NHTSA) are announced in a separate section headed NHTSA DOCUMENTS and are numbered in five distinct series: NHTSA Accident Investigation Reports (HS-600 000 series), NHTSA Compliance Test Reports (HS-610 000 series), NHTSA Contractors Reports (HS-800 000 series), NHTSA Staff Speeches, Papers, etc. (HS-810 000 series), and NHTSA Imprints (HS-820 000 series). For NHTSA DOCUMENTS in series HS-600 000 and HS-610 000, individual full case reports are available for inspection at the National Highway Traffic Safety Administration. HS-800 000 series and HS-800 000 series are available for purchase from NTIS or GPO (see page ii). Although announced together in a separate section, these documents are also assigned specific subject categories for machine retrieval.

A document which contains a number of separate articles is announced as a complete volume in the subject category most applicable to it as a whole. Entries for the individual articles appear in their most specific subject category.

SAMPLE ENTRIES

Subject Category Array

NHHS Accession no..... HS-800 218 Fld. 5/21; 5/9
Title of document..... AN INVESTIGATION OF USED CAR SAFETY STANDARDS-SAFETY INDEX: FINAL REPORT. VOL. 6 - APPENDICES G-L
Personal author(s)..... by E. N. Wells; J. P. Fitzmaurice; C. E. Guilliams; S. R. Kalin; P. D. Williams
Corporate author..... Operations Research, Inc.

Collation

Publication date..... 1969 150p
Contract FH-11-6921
Report no. ORI-TR-553-Vol-6; PB-190 523

Abstract..... Appendices G-L to this study of used car safety standards include: indenture model diagrams for classes I-IV motor trucks; degradation, wear, and failure data for motor truck classes I-IV; and safety index tables for classes I-IV motor trucks.

Search terms; Wear; Trucks;
Failures; Used cars; Inspection
standards

HS-004 497 Fld. 5/19

AUTO THEFT-THE PROBLEM AND THE CHALLENGE

by Thomas A. Williams, Sr.

Journal citation . . . Published in *FBI Law Enforcement Bulletin* v37 n12 p15-7 (Dec 1968)

Gives figures on the extent of the auto theft problem and comments on antitheft devices available now or in the planning stage.

Search terms: Theft; Theft protection; Stolen cars

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NOTE: Material published in Highway Safety Literature (HSL) is intended for the information and assistance of the motor vehicle and highway safety community. While brand names, equipment model names and identification, and companies may be mentioned from time to time, this data is included as an information service. Inclusion of this information in the HSL should not, under any circumstances, be construed as an endorsement or an approval of any particular product, course, or equipment by the U.S. Department of Transportation, National Highway Traffic Safety Administration.

AND
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GPO: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Give corporate author, title, personal author, and report number . Prepayment is required by GPO coupon (NTIS coupons are not acceptable), check or money order (made payable to the Superintendent of Documents).

HRB: Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N. W., Washington, D. C. 20418.

NHTSA: National Highway Traffic Safety Administration, General Services Division, Washington, D.C. 20591 (Telephone (202) 426-0874), Give HS-No.

SAE: Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. Order by SAE report numbers. Prices given are list;discounts are available to SAE members and sometimes to libraries and U.S. Government Agencies. Prepayment is required; orders received without payment are subject to a \$1 handling charge.

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1/0 ACCIDENTS**1/2 Injuries**

HS-010 459 Fld. 1/2

EVOLUTION OF ROAD ACCIDENT INJURIES

by P. L. Frank

Salford Univ. (England)

Published in HS-010 472, *Road Safety*,
1970 p75-82

Presented at a symposium on road safety held at the University of Salford, England, 14-15 May 1970.

Road accidents seemingly first occurred when men mounted horse or camel, and became progressively worse with the advent of the wheel and higher speeds. When the gasoline engine was invented, the true high-velocity accidents were born and have since increased in number and in severity. The elderly, children, pedestrians, passengers and their particular types of injuries are considered. It is concluded that some accidents will remain inevitable, but there is a pressing need for better roads, better cars, better drivers, better pedestrians, more first aid stations and better legislation.

Search terms: Accident severity; Impact severity; Injury severity; Injury causes; Injury factors; Age factors; Restraint systems; Traffic accidents; Speed; Injuries

HS-010 460 Fld. 1/2

HEAD INJURY IN ROAD ACCIDENTS

by R. A. C. Jones

Salford Univ. (England)

safety held at the University of Salford, England, 14-15 May 1970.

The problem of head injury in the context of road accidents is considered, mechanisms of head injury are discussed, the important types of head injury are detailed, with management and after care, and finally, measures towards the prevention of head injury in road accidents are outlined.

Search terms: Brain injuries; Head injuries; Injury prevention; Injury severity; Medical treatment

HS-010 461 Fld. 1/2; 1/3

TRAUMA AS A FUNCTION OF FORCES AND ACCELERATIONS IN COLLISIONS

by Lawrence M. Patrick

Wayne State Univ.

1971 18p
Report no. PR-1

Accomplishments during May-June 1971 include: familiarization with the form and reporting techniques of the University of California (Los Angeles) accident investigation team; evaluation of occupant injuries in terms of the AMA code for those cases in the UCLA file which were submitted prior to adoption of the AMA code; study of the computer filing and retrieval program with emphasis on the filtering and listing formats; retrieval of the UCLA cases in the filtered categories; establishment of the SAE vehicle deformation code for each case based on the photographs of the vehicle; development of individual interior component deformation scales to permit the degree of deformation to be correlated with the degree of injury of the occupant; tabulation of specific occupant injuries and interior component deformation scales for the cases in the filtered categories.

Photographs; Impact forces; Human body impact tolerances; Injury severity index; Human acceleration tolerances

1/5 Statistical Data

HS-010 462 Fld. 1/5

ROAD ACCIDENT STATISTICS

by F. Garwood

England Road Research Lab.

Published in HS-010 472, *Road Safety*,
1970 p4-15

7refs

Presented at a symposium on road safety, University of Salford, England, 14-15 May 1970.

This paper contains information on certain selected aspects of road accident statistics: trends in casualty and vehicle involvement rates; distribution of driver and motorcyclist casualties by age and time of day; effect of age and experience on casualty rates of drivers and motorcyclists; and effect of the Road Safety Act 1967. These statistics were largely obtained from the accident reports completed by the police. Estimates of mileage traveled were made by the Road Research Laboratory from automatic traffic counters and other sources.

Search terms: Accident statistics; Fatality rates; Motorcycle operators; Motorcycle passengers; Accident risks; Bicycle riders; Pedestrians; Fatalities by age; Passengers; Road Safety Act of 1967 (Great Britain); Great Britain; Drivers; Safety program effectiveness;

HS-010 463 Fld. 1/5; 3/11

A STUDY OF THE TRENDS IN PEDESTRIAN CASUALTIES ON AND NEAR ZEBRA CROSSINGS IN THE WEST RIDING OF YORKSHIRE

by T. E. Weaver

Published in *Technical Aspects of Road Safety* n36 p4.1-4.4 (Dec 1968)

The most commonly used pedestrian crossings in England are the zebra striped crossings. The results of this accident study are given in four tables: average number of pedestrian casualties per year; casualties on or near zebra crossings as a percentage of total pedestrian casualties for West Riding county area; trends in accident casualties on and near zebra crossings; and relative risk to pedestrians on and near zebra crossings. This investigation demonstrated that the casualty rate on zebra crossings was rising out of proportion to the total pedestrian casualty rate for the county area as a whole.

Search terms: Zebra crossings; England; Accident risk forecasting; Pedestrian accidents; Accident rates; Accident statistics

2/0 HIGHWAY SAFETY

2/4 Design and Construction

HS-010 464 Fld. 2/4

THE ROLE OF MODERN HIGHWAY DESIGN IN ROAD SAFETY

by D. Grant Mickle

Highway Users Federation - for Safety and Mobility

1970 14p

Presented at 6th World Highway Conference, Montreal, 6 Oct 1970.

rather than destructive forces. Problems of automobiles, especially the death toll, must be solved. The highway designer must consider the driver, the vehicle, and the road. Traffic volumes multiply driver errors. Mechanical failure must be anticipated. Roadsides must be made more forgiving. Safety deficiencies of minimum design standards are often irrevocable once built into the highway. Road signs must communicate effectively but not be hazards. Guardrails must be properly designed and used.

Search terms: Safety design; Highway design; Roadside hazards; Driver vehicle road interfaces; Accident prevention; Design standards; Highway signs; Sign design; Sign location; Sight distances; Guardrail design; Run off road accidents

HS-010 465 Fld. 2/4; 5/22

THE INFLUENCE OF THE ROAD SURFACE ON SKIDDING. PROCEEDINGS OF A SYMPOSIUM HELD AT THE CENTRE FOR TRANSPORT STUDIES, UNIVERSITY OF SALFORD, 16 OCTOBER 1968

Salford Univ. (England); England Road Res. Lab.

1968 144p refs

Papers presented dealt with the basic mechanics of tire-road adhesion, petrographic aspects of the polishing of roadstones, role of aggregates in skid-resistant roads, and skid testing. The subjects were comprehensively treated in discussion ranging from basic theory to practical construction and cost factors. Data are given on road material characteristics, skid performance, and relationship of skidding to accident rates.

Search terms: Tire mechanics; Tire pavement interface; Tire road conditions; Skidding; Skidding accidents; Accident rates; Chips; Pavement friction

Pavement surface texture; Pavement wear; Pavement tests; Pavement damage; Coefficient of friction; Aggregates; Road materials; Test equipment; Road surfaces; Lithology; Great Britain; Field tests; Wet road conditions

2/9 Traffic Control

HS-010 466 Fld. 2/9; 3/11; 1/5

TO PAINT OR NOT TO PAINT?

Anonymous

Published in *Public Works* v100 n4 p70-2 (Apr 1969)

A five year study (1963-67) was made in San Diego, California, to obtain factual data regarding the relative number of accidents that occur in painted and unpainted crosswalks. The data tend to indicate that the number of accidents in painted crosswalks exceeds those in unpainted crosswalks by an amount greater than might be expected in terms of usage, and might suggest to some that it is better to leave pedestrian crossings unmarked than to bother with painting them. However, it is suggested that the data presented may actually show that it is the pedestrian rather than the painted crosswalk that is at fault, and that a program to educate pedestrians might be indicated. It is suggested that better standards may be needed for determining when and where painted crosswalks should be established, and better techniques should be developed to increase the visibility of pedestrians.

Search terms: Pedestrian accidents; Crosswalks; Crosswalk markings; Accident rates; Pedestrian education; Intersections; Fatality rates; Accident location; Accident statistics; Time of day; Motor vehicle fatalities; Motor vehicle

HS-010 467 Fld. 2/9; 4/1

**STATE LAWS GOVERNING
MOTOR VEHICLE SPEED LIMITS**

National Hwy. Users Conference

1969 19p

Published in *Motor Vehicle Laws Digest Series*.

This publication digests the speed restrictions for cars, trucks, buses, and mobile homes in all 50 states. It is part of a series of summaries, studies, and bulletins designed to help keep the highway transportation family informed on the many developments which affect its progress in serving America more productively and efficiently.

Search terms: Speed limits; State laws; Automobiles; Trucks; Buses; School buses; Mobile homes; Residential location; Business location

3/0 HUMAN FACTORS

HS-010 468 Fld. 3/0

**MANPOWER DEVELOPMENT:
CRUCIAL NEED IN HIGHWAY
SAFETY**

by James E. Carnahan

Published in *Traffic Safety* v71 n9 p10-1, 35-6 (Sep 1971)

The analysis and definition of all job requirements and the complete understanding of personnel needs and capabilities are essential to the development of competent and effective manpower at all levels of traffic management and operations. The Highway Safety Act should be amended to provide for manpower development.

Search terms: Manpower utilization; Personnel; Highway Safety Act of 1966; Highway safety organization management; Highway safety pro-

3/1 Alcohol

HS-010 469 Fld. 3/1; 1/5

**A PRELIMINARY REPORT ON
ALCOHOL-INVOLVED CRASHES
IN WASHTEENAW COUNTY,
MICHIGAN**

by Joel D. Epstein

Published in *HIT LAB Reports* p1-7 (Aug 1971)

8refs

Washtenaw County, Michigan, is currently conducting a three-year Alcohol Safety Action Program for the National Highway Traffic Safety Administration. The primary focus of the analysis presented here is alcohol-involved crashes in the experimental program county, in a selected experimental control county, and in the state of Michigan overall. The results include other relevant factors such as relative driving exposure and the age of drivers. Data from some of the other factors may be significant in evaluating the effects of the Alcohol Safety Action Program in Washtenaw County.

Search terms: Accidents studies; Accident statistics; Blood alcohol levels; Drinking drivers; Accident rates; Driver mileage; Injury rates; Fatality rates; Accident severity; Time of day; Age factor in accidents; Sex factors in accidents; Alcohol Safety Action Projects; Driver age; Driver sex; Michigan

3/2 Anthropomorphic Data

HS-010 470 Fld. 3/2

**SOPHISTICATED SAM. FINAL
REPORT**

by C. T. Terry

General Motors Proving Ground

1971 8p

This report deals with the history of

cated Sam," a dummy which was designed to duplicate the frangibility of the human so that very minimal number of instruments need to be placed on the dummy to indicate true human response to the impact. The dynamic frangibility of Sophisticated Sam was tested and the results compared with actual accident results which approximated the same configuration as the tests. From this comparison it was concluded that Sophisticated Sam did not seem to simulate the frangibility of humans in similar dynamic situations.

Search terms: Human body simulation; Anthropomorphic dummies; Impact caused skeletal damage; Impact tests; History

HS-010 471 Fld. 3/2

**INVESTIGATIONS OF MAN'S
LINEAR ACCELERATION
THRESHOLD**

by Thomas H. Rockwell; John N. Snider; John C. Birkimer

Published in *Technical Aspects of Road Safety* v36 p3, 1-3.16 (Dec 1968)

5refs
Grant PHS-AC-28

Three studies concerning human perception of acceleration showed that man's mean threshold sensitivity level is between 0.01g and 0.02g. These studies show that man is capable of sensing acceleration differences at a level which is low enough to be of value in controlling a motor vehicle. Four variables appeared to have a potential effect on the threshold. These variables are method of threshold determination, position of subject, original velocity, and polarity (acceleration versus deceleration).

Search terms: Acceleration detection; Deceleration detection; Motion perception; Velocity perception; Speed changes; Human acceleration tolerances; Confidence intervals; Variance

3/4 Driver Behavior

**HS-010 472 Fld. 3/4; 1/5; 4/1;
3/5; 1/2; 3/11**

**ROAD SAFETY: A TWO DAY
SYMPOSIUM HELD AT THE
UNIVERSITY OF SALFORD,
14-15 MAY 1970**

by S. Raymond, ed.

Salford Univ. (England)

1970 99p
Report no. RSRU-93

Includes: HS-010 459, 460, 462,
474-476 and 485

Titles of the papers presented at the Symposium of the Centre for Transport Studies/Postgraduate Medical Institute are: Introduction and outlines of the research program; Road accident statistics; Trends in legislation aimed at reducing accidents; An investigation of the influence of driver education on the driving behavior of young people; A sociological contribution to research on human behavior in the road traffic situation; Head injury in road accidents; Evaluation of road accident injuries; and Studying the road user.

Search terms: Accident statistics; Driver license laws; Adolescent drivers; Driver education evaluation; Great Britain; Driver personality; Sociological factors; Head injuries; Injury factors; Driver behavior research; Driver education; Pedestrian safety; Legal factors; Accident prevention; Driver behavior; Accident research

**HS-010 473 Fld. 3/4; 3/1; 3/7;
3/12**

**THE MEDICAL ASPECTS OF
SAFE DRIVING**

by Ron Kenyon

The psychologists, judges, examiners, and motor vehicle administrators who constituted a seminar held in Toronto, Canada, discussed the complex relationships which enable a person to drive. Four main topics included in the discussion are: defective vision and safe driving; the effect of physical impairment in the safe operation of a motor vehicle; mental disorders and disclosures; and the effects of alcohol and other drugs on driving competence. It is hoped that improved methods of driver control and research will evolve from the discussions.

Search terms: Safety research; Vision disorders; Driver physical fitness; Driver mental fitness; Age factor in driving; Drug effects; Alcohol effects; Synergism; International factors

HS-010 474 Fld. 3/4; 3/5; 3/11

STUDYING THE ROAD USER

by J. P. Henry

England Road Res. Lab.

Published in HS-010 472, *Road Safety*,
1970 p83-99

Report no. RSRU-93

Presented at a symposium on road safety held at the University of Salford, England, 14-15 May 1970.

Problems primarily concerning the road user, rather than the vehicle or the road on which he travels are discussed. The aims of the work are to improve understanding of why accidents occur, and to suggest or evaluate ways in which accidents might be reduced. The different types of research, methods employed and results are discussed. Some examples of subjects on which research is carried out are: driver behavior; traffic conflicts; pedestrian behavior; school road safety programs; and driver training. In the driver training research, both content and methods of instruction are considered.

Search terms: Driver behavior research; Driver education; Pedestrian safety; Driver education evaluation; Driving simulators; Accident prevention; Mirror usage; Traffic conflicts; Curricula; Programmed instruction; Highway safety programs; Pedestrian behavior; Autotutor; Great Britain

HS-010 475 Fld. 3/4; 3/6

**THE CRIMINAL ON THE ROAD:
A SOCIOLOGICAL CONTRIBUTION
TO RESEARCH ON
HUMAN BEHAVIOUR IN THE
ROAD TRAFFIC SITUATION**

by T. C. Willett

Queen's Univ. (Canada)

Published in HS-010 472, *Road Safety*,
1970 p51-67

Presented at a symposium on road safety held at the University of Salford, England, 14-15 May 1970.

In 1959, a study was conducted to analyze cases convicted of dangerous driving, drunken driving, and driving while disqualified, in a police district near London during the three years 1957 to 1959. This study was fairly sketchy, and conducted with very limited resources. Therefore, in 1964, a further study was begun, with the primary aim of examining the real effects of the sentences passed on serious motoring offenders, especially of disqualification, and the secondary purpose of obtaining more information about them so that the typological hypotheses used in the earlier research, on another population of offenders, could be tested further. Results of these studies and recommendations are given.

Search terms: Convictions; Driver license cancellation; Driver license revocation; Driver license suspension; Driver personality; Driver social class; Drinking drivers; Driving without a

3/5 Driver Education**HS-010 476 Fld. 3/5****AA/CVM ROAD SAFETY RESEARCH PROJECT: YOUNG PEOPLE AND ROAD SAFETY**

by S. Raymond

Salford Univ. (England)

Published in HS-010 472, *Road Safety*, 1970 p26-50

Presented at a symposium on road safety held at the University of Salford, England, 14-15 May 1970.

An experimental project, aimed at assessing the influence of driver and traffic education on the subsequent behavior of adolescents, was started in September of 1968, in the schools of Salford, England. The methods employed, design of the course, tests given are explained in detail and compared with American high school driving courses. It is concluded that it cannot be said that driver safety education reduces accidents, since this has not yet been proved beyond reasonable doubt in quantitative terms. It is assumed that this is the most rational way of teaching young people how to handle a car in modern traffic and the associated responsibilities, and it is hoped that accident rates will thereby be reduced.

Search terms: High school driving courses; Driver education; Driver education evaluation; Curricula; Automobile driving ranges; Audiovisual aids; Behind the wheel instruction; Classroom driver instruction; Driver psychological tests; Driving simulators; Adolescent drivers; Driver tests; Psychological factors; Accident prevention; Great Britain

HS-010 477 Fld. 3/5; 3/9**DRIVER EDUCATION FOR THE EDUCABLY MENTALLY RETARDED**

by James H. Kubai/o; Charles J. Kokaska

Published in *Training School Bulletin* v66 n3 p111-4 (Nov 1969)

5 refs

Presented to the Student Council for Exceptional Children Convention, Grand Rapids, Mich., 7 Mar 1969.

Some studies have presented information which questions the ability of the educable mentally retarded to be successful drivers. Before we can discredit their ability to drive, we must first provide programs in driver education which are designed to meet the retarded's learning abilities. The results of a survey of high school driver education programs in southeastern Michigan suggests that our efforts should be seriously questioned.

Search terms: Mental retardation; Handicapped drivers; Driver education; High school driving courses; Driver education evaluation; Curricula; Michigan

3/6 Driver Licensing**HS-010 478 Fld. 3/6; 2/40****SENTENCING THE SUSPENDED OR REVOKED DRIVER**

by Betsy Fitzgerald Rahn

Published in *Traffic Digest and Review* p8-9 (Jun/Jul 1970)

Rehabilitation of the license-removed driver is not easy, since the violator is often a recidivist and has gone the educational and motivational route a number of times. The driver suspended under a financial-responsibility law is caught in an economic squeeze, for he must use his car to keep his job. He must also take his car to his insurance carrier to renew his insurance coverage.

often of value. A more serious problem is the driver whose record shows him to be dangerous or negligent; the jail sentence is almost a must, and on several repeated license violations, he may be sentenced up to six months in jail. Research and implementation of adequate facilities and techniques for effective education or effective rehabilitation would solve one of the greatest problems the courts have in educational and rehabilitative sentencing.

Search terms: Driver attitudes; Driver behavior; Driver improvement; Driver license revocation; Driver license suspension; Problem drivers; Legal factors; Driving without a license; Traffic court cooperation with other agencies; Uninsured drivers

HS-010 479 Fld. 3/6; 3/9**LICENSING THE DRIVER WITH MUSCULOSKELETAL DIFFICULTY**

by Michael S. Stock; William O. Light; John M. Douglass; Frederic D. Burg

Published in *Journal of Bone and Joint Surgery* v52-A n2 p343-6 (Mar 1970)

2 refs

The United States Public Health Service has prepared guidelines for the use of State Medical Advisory Boards in their role as consultants to the motor vehicle administrators. These guidelines are used for the licensing of motor vehicle operators who have musculoskeletal difficulty. The three categories of musculoskeletal performance discussed are: 1) motor power (muscle), 2) joint motion, and 3) absence of parts (amputation).

Search terms: Disability evaluation; Musculoskeletal system; Handicapped

3/8 Environmental Effects**HS-010 480** Fld. 3/8; 4/8; 2/4; 5/4**NOISE: ECONOMIC ASPECTS OF CHOICE**

by C. D. Foster; P. J. Mackie

Published in *Urban Studies* v7 n2 p123-35 (Jun 1970)

14 refs

Adapted from a lecture presented to the British Road Federation Conference on Road and Environmental Planning, Southampton, England, 24-28 Mar 1969.

To permit rational decisions on traffic noise, three types of problems must be resolved. They are development of noise measures that correlate with dissatisfaction, evaluation of alternative courses of action, and determination of the values of changes in noise level. The discussion considers noise measures; effectiveness of noise control through vehicle design, road construction, traffic operation, and urban planning; economic and social costs of the alternatives; and means for assessing the value of noise control to the people affected.

Search terms: Traffic noise; Vehicle noise; Opinion polls; Acoustic measurement; Benefit cost analysis; Noise control; Highway design; Great Britain; Sound absorbing materials; Urban planning; Traffic density

HS-010 481 Fld. 3/8; 3/4**OXYGEN REDUCTION AND REACTION TIME IN HYPOXIC AND NORMAL DRIVERS**

by James M. Ramsey

Published in *Archives of Environmental Health* v29 p597-601 (Mar 1970)

Grant PHS-1RO1AP00726-01APR

Thirty young, healthy, nonsmoking drivers and 30 older, presumably hypoxic, nonsmoking drivers were exposed to an average of 38.1 ppm of carbon monoxide (CO) during 90 minutes of commuting traffic. These groups showed an average of 0.49 and 1.14 volume percent reduction in oxygen (O_2) of capillary blood, respectively. A control group of 30 averaged a 0.04 volume percent reduction. Correlation of CO exposure with O_2 reduction was highly significant. In both groups, 27 of the 30 drivers were slowed in reaction time to a visual stimulus after being in traffic. The control group was 3.5% faster in reaction time the second time. Correlation of O_2 reduction and time slowing was significant. The hypoxic drivers had significantly less O_2 and were significantly slower in reaction time at the beginning than were the normal drivers.

Search terms: Driver reaction time; Carbon monoxide; Commuting costs; Blood carbon monoxide levels; Carboxyhemoglobin; Smoking; Anoxia; Air pollution effect on health; Driver performance; Driver physical fitness; Driver age; Blood oxygen levels

3/9 Impaired Drivers**HS-010 482** Fld. 3/9; 3/5**DRIVER TRAINING FOR THE SEVERELY HANDICAPPED**

by Leo Berner

Published in *American Corrective Therapy Journal* v22 n1 p18-20 (Jan-Feb 1968)

To the physically disabled person, the ability to drive a standard or specially equipped car with hand controls can often mean the difference between becoming a self-sustaining member of the

patients of the Bronx Veterans Administration Hospital, New York, is presented and illustrated with a case report.

Search terms: Handicapped drivers; Disability evaluation; Self help devices; Driver motivation; Driver education

3/11 Pedestrians**HS-010 483** Fld. 3/11; 4/7**AN EXPERIMENTAL METHODOLOGY FOR ANALYSIS OF CHILD PEDESTRIAN BEHAVIOR**

by Norman W. Heimstra; James Nichols; Gary Martin

Published in *Pediatrics* v44 supp p832-8 (Nov 1969)9 refs
Grant PHS-UI-01001-02

This investigation was undertaken in an attempt to develop a method which could be utilized to systematically observe and categorize pedestrian behavior of children. Kindergarten children were filmed at one specific intersection which bordered on the school ground. Two types of unsafe behavior were selected for detailed analysis: not stopping at the curb prior to entering the street, and not looking for oncoming traffic. Until more data are available, the validity of this method cannot be assessed with any degree of certainty; however, it is quite likely that this system might be useful in implementing a methodological approach which involves the utilization of unsafe behavior rather than accidents per se as data in certain types of accident prevention investigations.

Search terms: Children; Pedestrian behavior; Pedestrian accidents; Pa-

3/12 Vision

HS-010 484 Fld. 3/12; 3/6

GUIDELINES FOR EXAMINING THE DRIVER WITH VISUAL DIFFICULTY

by William O. Light; Frederic D. Burg; Michael S. Stock; John M. Douglass

Published in *American Journal of Ophthalmology* v69 n6 p1019-22 (Jun 1970)

The United States Public Health Service has issued guidelines for State Medical Advisory Boards to use in their role as consultants to the motor vehicle administrators. These guidelines concern the licensing of motor vehicle operators with impaired vision. Groups of drivers discussed are defined according to the severity of their functional impairment, and classified by type of vehicle license they are seeking: passenger transport, cargo transport, or private auto. The vision categories discussed are: visual acuity, visual fields, ocular motility, color blindness, and dark adaptation. Certain classes of drivers should be re-evaluated periodically in order that impairment changes may be detected.

Search terms: Driver vision standards; Visual acuity; Visual fields; Color blindness; Dark adaptation; Binocular disparity; Vision disorders; Driver licensing; Eye movements

4/0 OTHER SAFETY-RELATED AREAS**4/1 Codes and Laws**

HS-010 485 Fld. 4/1; 1/3

TRENDS IN LEGISLATION AIMED AT REDUCING ACCIDENTS

Published in HS-010 472, *Road Safety*, 1970 p16-25

Presented at a symposium on road safety, held at the University of Salford, England, 14-15 May 1970.

The trends in legislation dealing with the reduction of accidents are examined in relation to the driver's fitness, ability, and protection; the fitness of the vehicle; the driver's conduct on the road; and insurance. It is concluded that in most cases the legislative measures available to bring about a reduction in accidents are adequate in their extent and purpose. The law is there to be used; its application and enforcement are a matter of ministerial policy.

Search terms: Traffic laws; Law enforcement; Driver license laws; Vehicle safety; Inspection laws; Driver behavior; Alcohol laws; Insurance laws; Accident prevention; Driver physical fitness; Headgear laws; Great Britain

4/5 Information Technology

HS-010 486 Fld. 4/5; 2/9

SYSTEMS ANALYSIS APPROACH TO PROCESSING OF VEHICULAR TRAFFIC RECORDS FROM CONTINUOUS-COUNT STATIONS

by David K. Phillips; Stanley Woolman

Bureau of Public Roads

Published in *Highway Research News* n13 p55-69 (Jun 1964)

One of the principal objectives of this paper is to promote the concept of a systems analysis approach to traffic volume survey work in its entirety—data reduction, on-time dissemination of routine census-type reports, analytical compilations as by-products of routine processing, and a continuity of research on selected traffic characteristics to pro-

Traffic data analysis; Data acquisition; Punched cards; Information retrieval; Traffic surveys; Data analysis; Tapes; Traffic counts; Traffic volume; Data processing; Flow charts; Computerized records management

HS-010 487 Fld. 4/5; 5/4

DESIGN-BY-COMPUTER

by Arthur H. Delmege

Sperry Rand Corp.

1971 5p
Report no. SAE-710712

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

Design-by-computer is a viable design technique for general engineering design due to the availability of large-scale digital computers for engineering applications. In the design-by-computer concept, the designer inputs the specified operating characteristics for the component or system to be designed, and the program will output the dimensions of the design parameters required to meet these specifications. Hundreds of designs can be computed in minutes. This frees the engineer to improve his design methodology, analysis, decision-making criteria, and the design-synthesis process.

Search terms: Computerized design; Automotive engineering; Vehicle design

AVAILABILITY: SAE

HS-010 488 Fld. 4/5; 4/7; 5/4

DIGITAL COMPUTER USE IN HYDRAULIC SYSTEMS DESIGN

by Robert L. Anderson

General Electric Co.

4/5 Information Technology (Cont'd.)

HS-010 488 (Cont'd.)

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

Several examples of digital computer applications to systems analysis are given. A linearized mathematical model is developed for a small hydraulic system, simplified and used as input for a prewritten computer program which produces data suitable for stability estimation. The same model is used in conjunction with a standard library program to obtain the step response of the system. A nonlinear model is developed and numerical integration applied to obtain estimates of the time function.

Search terms: Computerized simulation; Computerized design; Hydraulic equipment; Digital computers; Simulation models; Systems engineering; Mathematical analysis; Mathematical models; Linear systems; Nonlinear systems; Equations

AVAILABILITY: SAE

4/8 Transportation Systems

HS-010 489 Fld. 4/8

A SURVEY OF AVERAGE DRIVING PATTERNS IN THE NEW YORK URBAN AREA

by D. H. Kearin; R. L. Lamoureux

System Devel. Corp.

1970 141p
Report no. TM-(L)-4119/006/00

Results are presented from the survey of average driving patterns in the New York urban area. The first section presents a detailed description of the several typical driving patterns. The second section presents a summary description of the data base from which the typical patterns were derived. The third section presents a comparison between the New York

out previously in Los Angeles, Houston, Cincinnati, Chicago and the Twin Cities.

Search terms: New York (City); Travel patterns; Travel modes; Travel time; Trip distribution models; Trip frequencies; Traffic generation; Trip length; Parking; Speed patterns; Highway usage; Automobile urban usage; Taxicab usage; Day of week; Time of day; Trip purpose; Surveys

5/0 VEHICLE SAFETY

HS-010 490 Fld. 5/0

PROGRESS IN AREAS OF PUBLIC CONCERN

General Motors Proving Ground

1971 49p

Includes HS-010 493, HS-010 498 and HS-010 501

This booklet, prepared for General Motors stockholders, reports a conference held at the General Motors Proving Ground in Feb 1971. The conference was called to explain the progress General Motors has made in a number of areas of public concern and to obtain the participants' thoughts as to the Corporation's activities and goals in these areas. Presentations were: Overview of Emissions Control; Automotive Emission Control; Industrial Pollution Control; Abandoned Cars; Urban Transportation; Minority Opportunities; Automotive Safety; Passive Restraints; Barrier Crash and Bumper Demonstration; and Impact Sled Demonstration. Summaries of the discussions following these presentations are also included.

Search terms: Exhaust emission control; Exhaust emission standards; Air pollution control; Industrial air pollution; Scrapped automobiles; Urban transportation; Vehicle safety; Passive restraint systems; Air bag restraint systems; Net restraint systems; Energy absorbing bumpers; Barrier collision tests; Impact sleds; General Motors

facilities; Manpower utilization; Vehicle air pollution

5/1 Brake Systems

HS-010 491 Fld. 5/1; 5/18

APPLICABILITY OF BRAKING CONTROL SYSTEMS TO HIGHWAY VEHICLES. FINAL REPORT

by George R. Olsson; Peter G. Fielding

Booz-Allen Applied Res., Inc.

1970 300p 80 refs
Contract FH-11-6895
Report no. PB-199 812

This report focuses upon problems concerned with highway vehicle dynamic response and control in emergency braking maneuvers and the applicability of automatic braking control systems to the improvement of safety and vehicle performance in these maneuvers. It is shown that automatic braking control systems can improve vehicle response and handling characteristics in the following areas: (1) stopping distance; (2) lateral stability characteristics in braking maneuvers; (3) directional control characteristics in maneuvers with combined braking and steering. Conclusions and recommendations of this study emphasize the potential benefits to highway safety to be gained with improvements in vehicle response in accident avoidance maneuvers, and, in particular, the applications of automatic braking control systems in this area.

Search terms: Vehicle control; Vehicle performance; Automatic brakes; Vehicle stability; Stopping distance; Vehicle dynamics; Accident avoidance; Reaction time; Brake systems; Vehicle handling; Steering; Yaw; Braking; Mathematical models; High speed; Antilocking devices; Equations of motion; Sideslip; Tire slip motion; Static margin; Lateral force

HS-010 492 Fld. 5/1; 5/20**EMERGENCY PARKING BRAKES FOR UTILITY VEHICLES**

by G. P. Larson; R. J. Sabin

Pacific Gas and Electric Co.

[1968] 5p
Report no. 680164

The purpose of this paper is to present data on a safety device which will, upon loss of air pressure, automatically, or when manually operated, apply the brakes of a vehicle. It is now possible to provide an emergency braking system capable of stopping a vehicle in the event of a failure in the air brake system. The spring brake unit provides a failsafe feature as well as a positive parking brake. A brief but effective inspection should be made daily before the vehicle is driven as a quick check on the condition of the air brake system. This inspection procedure, in conjunction with spring brake units, should ensure a vehicle which is safe to operate.

Search terms: Truck emergency brakes; Air brakes; Automatic brakes; Parking brakes; Brake system design; Brake inspection; Spring brakes

5/4 Design**HS-010 493 Fld. 5/4****AUTOMOTIVE SAFETY**

by Louis C. Lundstrom

General Motors Res. Labs.

Published in HS-010 490, *Progress in Areas of Public Concern*, 1971 p36-40

The late 1950's and the early 1960's saw the beginnings of needed research into human tolerance to determine causes of injury resulting from vehicle accidents. The General Motors Safety Research and De-

leading to safety improvements and that establish proof of compliance for areas covered by the motor vehicle safety standards. The different functions of the Safety Laboratory are described in this paper.

Search terms: Proving ground tests; Test equipment; Proving grounds; Test facilities; Vehicle safety; Occupant protection; Accident research; Crashworthiness; Safety design; General Motors Corp.; Compliance

HS-010 494 Fld. 5/4**A COMPONENT MANUFACTURER CONSIDERS HYDRAULIC OILS FOR MOBILE SERVICE**

by Richard L. Leslie

Sperry Rand Corp.

1971 7p 3refs
Report no. SAE-710722

Presented at the National Farm, Construction, and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

Mobile hydraulic systems traditionally operate under severe conditions in a wide range of climates. Many types of oils, other than those specifically formulated for hydraulic systems, are being used for mobile hydraulic service. Among the more widely used are automotive and diesel engine oils and automotive transmission fluids. The major properties and characteristics to be considered are wear protection, viscosity, fluid stability, rust protection, and filterability. These factors are discussed in reference to their effect on component and system operation.

Search terms: Hydraulic fluids; Hydraulic equipment; Transmission fluids; Lubricants; Lubricating oil; Wear resistance; Rustproofing; Viscosity; Temperature; Fluidics; Filtration

HS-010 495 Fld. 5/4**A REVIEW OF SOLID LUBRICATION TECHNOLOGY**

by Mahlon E. Campbell

Midwest Res. Inst.

1971 7p 24refs
Report no. SAE-710732

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

The function of this paper is a review of the solid lubricant technology. Emphasis has been placed on lubricating solids, bonded films including binder materials, and developments in the self-lubricating materials including plastic and metal-bonded composites. Typical uses of solid lubricants are cited. Design guidelines for use of bonded films and self-lubricating composites are outlined.

Search terms: Solid lubricants; Lubricant additives; Lubrication; Friction; Wear; Bonding; Solid lubricant powders; Plastic bearings

AVAILABILITY: SAE

HS-010 496 Fld. 5/4**POLYISOBUTYLENE, A NEW SYNTHETIC MATERIAL FOR LUBRICATION**

by G. J. Souillard; F. Van Quachhoven; R. B. Dyer

Cosden Oil and Chemical Co.; Labofina S.A. (Belgium)

1971 10p 14refs
Report no. SAE-710730

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

A promising new lubricant for two-stroke engines has been shown to reduce

5/4 Design (Cont'd.)**HS-010 496 (Cont'd.)**

is polyisobutylene, a polymerized olefin, which is available in commercial quantities. The new lubricant, PIB, has been successfully demonstrated in various field and laboratory tests, all of which are described here.

Search terms: Fuel additives; Lubricant additives; Two stroke cycle engines; Outboard motors; Wankel engines; Exhaust emissions; Lubricants; Lubrication; Olefins; Lubricating oil tests; Smoke control; Mineral oils; Engine deposits; Air cooled engines; Rotary piston engines; Polyisobutylene

AVAILABILITY: SAE

HS-010 497 Fld. 5/4**THE USE OF ELASTOHYDRO-DYNAMIC LUBRICATION IN UNDERSTANDING BEARING PERFORMANCE**

by Charles A. Moyer

Timken Roller Bearing Co.

1971 14p 26refs

Report no. SAE-710733

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

This paper is a survey introduction of elastohydrodynamic (EHD) lubrication for the practicing engineer. A brief description of the theoretical background and experimental evidence of the EHD lubricant film existing in concentrated contacts as found in bearings and gears is provided. The influence of the range of EHD and partial EHD lubricant conditions on bearing performance and mode of fatigue is next explored. The evidence discussed is drawn primarily from carburized and hardened tapered

Search terms: Surveys; Elastohydrodynamics; Lubricants; Lubrication; Bearings; Rolling contacts; Cylindrical roller bearings; Wear tests; Fatigue tests; Thin films; Thick films; Mineral oils

AVAILABILITY: SAE

5/6 Fuel Systems**HS-010 498 Fld. 5/6****AUTOMOTIVE EMISSION CONTROL**

by William G. Agnew

General Motors Res. Labs.

Published in HS-010 490, *Progress in Areas of Public Concern*, 1971 p5-13

Transportation sources combined contribute more than 50% of the man-made hydrocarbons and a little over 60% of the total carbon monoxide emissions. In addition, about 40% of the oxides of nitrogen emissions come from transportation sources. This paper describes action, taken by General Motors to minimize automotive exhaust emissions, and their research and development program designed to bring about substantial additional reductions in emissions of their motor vehicles in the next few years.

Search terms: Exhaust emission control; Hydrocarbons; Carbon monoxide; Nitrogen oxides; Air pollution control; Exhaust emission control devices; Evaporative emission control devices; Lead free gasoline; Octane requirements; Propulsion systems; Compliance; Vehicle air pollution; Crankcase emission control; Particulate air pollutants; General Motors Corp.; Air fuel ratio

5/10 Lighting Systems**HS-010 499 Fld. 5/10****COMPUTERIZE YOUR CAR LIGHTS. PT. 1, 2 AND 3**

Published in *Radio-Electronics* v39 n8 p42-5 (Aug 1968); n9 p59-61 (Sep 1968); n10 p39-41 (Oct 1968)

An estimated 15% of automobiles are driven with defective lighting, and it could be years before low-cost lighting failure detectors will be offered by auto manufacturers. However, it is now possible for a person familiar with electronics to design his own computerized lighting system with the aid of a few diagrams and some instructions. For under \$20 it is possible to construct a computerized monitoring system which not only tells the driver whether or not his car lights are working correctly, but also notifies the driver which lights should be on or off during the day or night. The computer device can also be equipped to remind the driver to switch his headlights off after a night's drive.

Search terms: Warning systems; Safety devices; Headlamp failures; Vehicle lighting; Lighting equipment; Indicator lights; Detectors; Electronic monitoring systems; Lamp failures; Safety device costs; Lighting equipment costs

5/11 Maintenance and Repairs**HS-010 500 Fld. 5/11; 5/20****SELECTION OF HYDRAULIC FLUIDS FOR A COMPLEX EQUIPMENT FLEET**

by J. S. Ferrie; W. L. Saxon

Ontario Hydro (Canada)

1971 7p
Report no. SAE-710737

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

The widespread use of hydraulically operated systems in mobile work and transport equipment has increased the

evaluation has helped to reduce the number of different products recommended by the equipment manufacturers to a number that is reasonable for field use. Extensive laboratory testing and field experience by Ontario Hydro has shown that two basic oil types Dexron ATF and Mil-H-5606B low-temperature aircraft hydraulic fluid, will meet more than 90% of hydraulic requirements of a large diversified fleet operating at temperatures as low as -45°F. Temperature-viscosity curves and other comparisons are given for new and used low-temperature fluids, and hydraulic-system cold weather starting procedures are listed.

Search terms: Low temperature; Cold weather starting; Cold weather tests; Temperature endurance tests; Vehicle maintenance; Hydraulic equipment; Hydraulic fluids; Lubricating oil tests; Off the road vehicles; Heavy duty vehicles; Canada; Viscosity; Laboratory tests; Field tests

AVAILABILITY: SAE

5/14 Occupant Protection

HS-010 501 Fld. 5/14

PASSIVE RESTRAINTS

by David D. Campbell

General Motors Corp.

Published in HS-010 490, *Progress in Areas of Public Concern*, 1971 p41-3

The National Highway Traffic Safety Administration issued a federal standard requiring all new cars manufactured for sale in the United States after July 1, 1973, to be equipped with passive restraints for all front seat passengers. Similar devices will be required for rear seat passengers a year later. General Motors has been doing research on air bags for the front seat and back seat passengers and on a rear seat and side

adventer deployment, failure to deploy when needed or delayed deployment, for which solutions haven't been found yet.

Search terms: Passive restraint systems; Air bag restraint systems; Air bag inflation devices; Net restraint systems; Occupant protection; General Motors Corp.

HS-010 502 Fld. 5/14

THE CHILD'S PLACE IN THE CAR

by William D. Alsever

Published in *American Family Physician* v3 n2 p167-70 (Feb 1971)

Vehicular deaths and injuries have become the major unsolved problem in pediatrics. The major reason is that so few children are correctly restrained in the automobile. The basic premise for providing crash protection is to anchor the child to his seat; however the majority of safety restraints sold today are useless. There are some effective devices available and their uses cover four weight groups: birth to 12 lbs., 12 lbs. to 24 lbs., 25 lbs. to 50 lbs., and over 50 lbs.

Search terms: Restraint system effectiveness; Child restraint systems; Infant restraint systems; Injury prevention; Infant injuries

5/20 Trucks and Trailers

HS-010 503 Fld. 5/20

PRODUCT VERIFICATION TESTS ON A SNOWMOBILE

by J. Lindley Smith

Outboard Marine Corp.

1971 7p 4refs
Report no. SAE-710711

Experimental stress analysis has proved itself to be a useful and valuable engineering tool that was used with design and testing programs on experimental snowmobiles to assure reliability. It also helped reduce the testing time. Design changes were made with an accurate knowledge of the stresses involved and in some cases were processed before endurance testing produced a broken part. V-belt sheaves were analyzed and strengthened. A high-temperature evaluation of piston material helped cure a piston pin hammering problem.

Search terms: Snowmobile design; Stress measurement; Failure stress; Durability tests; Temperature endurance tests; Sheaves; Stress analysis; Chassis; Pistons

AVAILABILITY: SAE

NHTSA DOCUMENTS

NHTSA Contractors Reports

HS-800 540 Fld. 5/14; 4/7

RESEARCH AND DEVELOPMENT OF AN ADVANCED INFLATABLE OCCUPANT RESTRAINT SYSTEM. FINAL REPORT

by Norris E. Shoemaker

Cornell Aeronautical Lab., Inc.

1971 261p 20refs
Contract FH-11-7574
Report no. CAL-YB-2985-V-1

Report for Jul 1970 – Sep 1971.

This research program was conducted to evaluate a current conventional inflatable occupant restraint system and to design and demonstrate an advanced inflatable restraint system for right front seat occupants in frontal collisions. Air bag design parameters were examined through analytical simulations and impact sled experiments. Test results of this multiple cell air bag system demon-

NHTSA Contractors Reports (Cont'd.)

HS-800 540 (Cont'd.)

therefore provides a means for tailoring the stiffness of various portions of the bag for improved control of occupant kinematics and accelerations. Other advantages of the multiple cell air bag that were demonstrated include the ability to provide protection for the occupant in multiple collisions and in oblique-angle frontal vehicle impacts.

Search terms: Mathematical models; Anthropometric dummies; Impact sleds; Computerized simulation; Impact tests; Parameters; Occupant kinematics; Pendulum tests; Front seat passengers; Air bag restraint systems; Restraint system tests; Front end collisions; Occupant protection; Air bag inflation devices; Deceleration tolerances

AVAILABILITY NTIS

HS-800 543 Fld. 5/4; 5/14

CAR CRASH TESTS. FINAL REPORT

by J. H. McElhaney; D. H. Robbins; A. W. Henke; V. L. Roberts

Michigan Univ. Hwy. Safety Res. Inst.

1971 65p
Contract FH-11-6962
Report no. HSRI-71-121

Report for Jul 1970 - 30 Jun 1971.

To provide comparison between sled testing results and actual car crashes, four 1966 Ford Galaxy 4-door sedans without steering columns were crashed. Two 50th percentile dummies rode in the front seat and a 3-year old child dummy rode in the rear. The sleds had a fixed head position. The sleds had a fixed head position.

was restrained with a styrofoam knee block and an inflatable restraint system (airbag). Comparison with sled tests using identical restraints showed poor agreement, indicating severe difficulties in extrapolation of sled tests to predict injury reduction potential of candidate restraint systems in automobiles.

Search terms: Barrier collision tests; Anthropometric dummies; Test equipment; Restraint system effectiveness; Ford Galaxy; Restraint system tests; Head on impact tests; Air bag restraint systems; Four point restraint systems; Angle impact tests; Child safety seats; Seat back failures

AVAILABILITY: NTIS

HS-800 550 Fld. 1/3; 5/17

MULTIDISCIPLINARY INVESTIGATIONS TO DETERMINE RELATIONSHIP BETWEEN VEHICLE DEFECTS, FAILURES, AND VEHICLE CRASHES. FINAL REPORT

by John R. Finch; James P. Smith

Baylor Univ.

1971 221p
Contract FH-11-7401
Report no. BCM-6

This is a report of 50 crashes by the Baylor College of Medicine Multi-disciplinary Crash Investigation Team involving late model vehicles. The overall research purpose was to: identify crash causation; identify injury causation; evaluate effectiveness of new safety features; provide early detection of design and junctional problems of vehicle and highway; and determine aging effects in vehicles and value of periodic vehicle inspection.

Search terms: Accident case reports; Accident causes; Injury causes; Safety

Accident research; Accident location; Accident factors; Driver behavior; Psychological factors; Automobile defects; Bumper design; Injury prevention; Restraint system usage; Automobile interior design; Alcohol usage; Chi square test; Blood alcohol levels; Injuries by sex; Racial factors; Injuries by age; Accident survivability; Weather; Traffic control devices; Crashworthy bodies; Energy absorbing steering columns

AVAILABILITY: NTIS

HS-800 554 Fld. 3/0; 4/4

HIGHWAY SAFETY OCCUPATIONAL PROGRAM DEVELOPMENT GUIDE

by Ronald D. Daugherty; W. Kent Brooks; Carroll R. Hyder

Ohio State Univ.

1971 113p 206refs
Contract FH-11-7507

This guide is a further synthesis of curriculum and resource materials from a nationwide search focused on highway-safety occupations. These materials provide an overview of the field of highway safety, feature existing highway safety occupational programs and training materials, identify needs in eleven occupations which have the greatest potential in terms of national priority need, and emphasize the resources needed in planning and developing occupational education programs.

Search terms: Inspector training; Alcohol breath tests; Highway engineering; Traffic engineering; Accident investigation training; Instructors; School bus drivers; Police traffic services; Driver license examiners; Pedestrian safety; Ambulance personnel training; Police training; Manpower utilization; Highway safety programs

HS-800 581 Fld. 1/3**MULTIDISCIPLINARY HIGHWAY CRASH INVESTIGATION TEAM. FINAL REPORT**

by Kent B. Joscelyn; John R. Treat

Indiana Univ.

1970 190p

Contract FH-11-7244

Report no. FH-11-7244-MCR-70-1

Report for 1 Jul 1969 – 30 Jun 1970.

On-scene and in-depth follow-up investigation of 25 Indiana vehicle-related accidents was conducted. Medical, engineering, and experienced accident investigation personnel comprised the primary elements of the investigative team. Objectives of the project were: identification of accident causation and injury causation; evaluation of safety feature effectiveness; detection of design and functional problems of the vehicle and highway; determination of vehicle aging effects and the value of periodic inspection; and study of driver characteristics. Case summaries are presented and causal factors discussed. Driver error was the primary cause in nearly all cases; vehicular and environmental factors usually were involved also.

Search terms: Accident investigation; Accident factors; Defective vehicles; Multidisciplinary teams; Injury causes; Indiana; Accident causes; Accident case reports; Safety device effectiveness; Highway design; Vehicle design; Vehicle age; Vehicle inspection; Driver characteristics; Accident studies; Accidents by vehicle age; Driver error caused accidents; Environmental factors; Driver characteristics

AVAILABILITY: NTIS

HS-800 590 Fld. 5/4**AN EVALUATION OF THE**

by Melvin O. Ryder; James B. Walunas;
Norman J. DeLeys

Cornell Aeronautical Lab., Inc.

1971 70p

Contract FH-11-7317

Report no. CAL-VJ-2844-V-2

The evaluation of this collision-force recorder was based on laboratory determinations of sensitivity and frequency response characteristics and on results of measurements of the impact accelerations of automobiles which were crash tested in a variety of impact situations. Acceleration data recorded in full-scale vehicle impacts were compared with data obtained from strain-gauge accelerometers and from velocity measurements. Results from the recorders tested were in substantial agreement with the other methods except for low accelerations and lateral forces.

Search terms: Impact tests; Laboratory tests; Impact forces; Instrumentation; Test equipment; Accelerometer tests; Instrumented vehicles; Recorders

AVAILABILITY: NTIS

HS-800 591 Fld. 2/0; 4/2**PLANNING FOR CONCENTRATED IMPLEMENTATION OF HIGHWAY SAFETY COUNTERMEASURES. VOL. 1. INTRODUCTION AND SUMMARY. FINAL REPORT**

by James O'Day

Michigan Univ. Hwy. Safety Res. Inst.

1971 42p 8refs

Contract FH-11-7613

Report no. HSRI-71-117-Vol-1

Report for 1 Jul 1970 – 31 Aug 1971.

Although the sixteen Highway Safety Program Standards have been in effect for some time, their adoption by the individual states has been less than com-

improved safety benefits, a need exists for determining and ranking the efficacy of highway safety countermeasures. Six program categories are defined which cover the range of activities defined by the standards. Demonstration programs are suggested for: road user regulation, information flow, road user preparation, vehicle regulation, system restoration, and highway regulation.

Search terms: Highway safety programs; Highway safety standards; Demonstration projects; State government; Federal state relationships; Program evaluation; Benefit cost analysis; Law enforcement; Traffic records; Driver education; Vehicle inspection; Pedestrian education; Emergency medical services; Debris removal; Traffic control devices; Highway design; Planning

AVAILABILITY: NTIS

HS-800 592 Fld. 2/0; 4/4**PLANNING FOR CONCENTRATED IMPLEMENTATION OF HIGHWAY SAFETY COUNTERMEASURES. VOL. 2. PROGRAM PLANNING CONSIDERATIONS. FINAL REPORT**

by J. O. Day; J. S. Creswell, Jr.; J. A. Green; M. E. Lee; S. Schultz, 2nd.

Michigan Univ. Hwy. Safety Res. Inst.

1971 95p 7refs

Contract FH-11-7613

Report no. HSRI-71-117-Vol-2

Report for 1 Jul 1970 – 31 Aug 1971.

At present there is a recognized need to improve the basis on which resource commitments to highway safety activities will be made in future years. The goal of the present study is to formulate detailed plans for experimental programs that will determine the impact of selected safety countermeasures. This

NHTSA Contractors Reports

(Cont'd.)

HS-800 592 (Cont'd.)

programs. From a discussion of the general highway traffic system, six program areas are defined. For each program category, there is a discussion of program goals, applicable countermeasures, measures of effectiveness, and data requirements. Considerations involved in the choice of a suitable site for each program are also stressed.

Search terms: Highway safety standards; Planning; Program evaluation; Safety program effectiveness; Demonstration projects; Highway safety programs; Models; Driver behavior; Traffic laws; Police law enforcement responsibilities; Traffic records; Accident records; Driver records; Driver education; Driver licensing; Pedestrian education; Vehicle inspection; Emergency medical services; Debris removal; Highway design; Traffic control devices; Pedestrian safety; Computerized safety research techniques

AVAILABILITY: NTIS**HS-800 593 Fld. 2/0; 4/2****PLANNING FOR CONCENTRATED IMPLEMENTATION OF HIGHWAY SAFETY COUNTERMEASURES. VOL. 3. DETAILED PROGRAM PLANS. FINAL REPORT**

by J. O'Day; J. S. Creswell, Jr.; J. A. Green; M. E. Lee; J. C. Marsh, 4th; S. Schultz, 2nd.

Michigan Univ. Hwy. Safety Res. Inst.

1971 290p 72refs

Contract FH-11-7613

Report no. HSRI-71-117-Vol-3

Report for 1 Jul 1970 - 31 Aug 1971.

In order to justify the allocation of

determining the efficacy of accident countermeasures. Experimental demonstration programs have been designed for six program categories covering the range of Highway Safety Program Standards. The experiments demonstrate program evaluation and serve to collect data for rating countermeasures. Program plans for each of the six evaluation experiments are contained in this report. Experiments include the categories: road user regulation; information flow; road user preparation; vehicle regulation; system restoration; and highway regulation.

Search terms: Impact tests; Laboratory tests; Impact forces; Instrumentation; Test equipment; Accelerometer tests; Planning; Highway safety programs; Driver behavior; Traffic laws; Police law enforcement responsibilities; Driver education; Michigan; Pedestrian safety; Child safety education; Driver licensing; Program evaluation; Demonstration projects; Costs; Vehicle inspection; Federal state relationships; Emergency medical services; Debris removal; Highway design; Traffic control devices; Accident research

AVAILABILITY: NTIS**HS-800 594 Fld. 2/0****PLANNING FOR CONCENTRATED IMPLEMENTATION OF HIGHWAY SAFETY COUNTERMEASURES. VOL. 4. REPORT BIBLIOGRAPHY. FINAL REPORT**

by John A. Olson; Joseph C. Marsh, 4th

Michigan Univ. Hwy. Safety Res. Inst.

1971 85p refs

Contract FH-11-7613

Report no. HSRI-71-117-Vol-4

Report for 1 Jul 1970-31 Aug 1971.

measure development for each of the sixteen safety standards. The bibliography contains 1000 entries that are grouped by standard area. Contained in this collection are general discussions of the problems and attitudes common to the standard area; reports on current and proposed countermeasures; evaluations of pertinent methodologies; and presentations of factual data.

Search terms: Bibliographies; State of the art studies; Highway safety standards; Planning; Management; Vehicle inspection; Vehicle registration; Motorcycle safety; Driver education; Driver licensing; Traffic laws; Traffic courts; Alcohol effects; Accident location; Traffic records; Emergency medical services; Highway design; Traffic control devices; Pedestrian safety; Police traffic services; Debris removal

AVAILABILITY: NTIS**HS-800 595 Fld. 3/1; 4/1; 2/8****ALCOHOL ENFORCEMENT COUNTERMEASURES MANUAL**

International Assoc. of Chiefs of Police

1971 210p 355 refs
Contract DOT-HS-036-1-042

The manual embodies a total multidisciplinary approach to the problem of controlling the drinking driver through initiation and development of alcohol enforcement countermeasures. The problems are approached in two ways - one in terms of the problem drinker in society and the other in terms of what can be done to counter the problems which he causes on the highways. A review of the research on the relationships of alcohol abuse to highway safety and the general nature of the problems encountered by police in the enforcement of drinking driver laws are discussed in detail. The final part of the manual discusses the relationships between police and other groups in the law enforcement of alcohol safety.

This document contains neither recommendations nor conclusions of the National Highway Traffic Safety Administration. It is the property of NHTSA and is loaned to your agency; it and its contents are not to be distributed outside your agency without the express written consent of the Administrator.

responsibilities; Alcohol laws; Community support of police; Police cooperation with other agencies; Alcohol usage; Alcohol effects; Manuals; Drinking drivers; Problem drivers; Alcoholism; Law enforcement; Alcohol usage deterrents; Accident causes

HS-800 596 Fld. 1/3

MULTIDISCIPLINARY ACCIDENT INVESTIGATION. VOL. 2. CASE SUMMARIES. FINAL REPORT

by J. Robert Cromack

Southwest Res. Inst.

1971 226p
Contract FH-11-7219
Report No. SWRI-11-2632-Vol-2

Report for 13 Jun 1969-28 Feb 1971.

This volume is a compendium of the case summaries of 53 multidisciplinary investigations of motor vehicle accidents in Texas by a team of engineers, physicians, psychologists, and other specialists. This research effort is intended to define unknown factors concerning highway collisions so that road, vehicle, and human improvements can be accomplished to make the highway system safer.

Search terms: Accident investigation; Accident factors; Multidisciplinary teams; Accident case reports; Accident causes; Accident types; Texas

AVAILABILITY: NTIS

HS-800 599 Fld. 3/1; 3/4

ALCOHOL AND HIGHWAY SAFETY: BEHAVIORAL AND MEDICAL ASPECTS. FINAL REPORT

by M. W. Perrine; Julian A. Waller; Lawrence S. Harris

Vermont Univ.

1971 310p 50 refs
Contract FH-11-6899; FH-11-6609

Report for Jun 1967-Dec 1969.

Drivers involved in fatal and serious crashes were compared with drivers using

AVAILABILITY: NTIS

HS-800 597 Fld. 1/3

MULTIDISCIPLINARY ACCIDENT INVESTIGATION. VOL. 1. TECHNICAL REPORT. FINAL REPORT

by J. Robert Cromack

Southwest Res. Inst.

1971 115p 29 refs
Contract FH-11-7219
Report No. SWRI-11-2632-Vol-1

This report of multidisciplinary accident investigations in Texas contains a summary of the results of 53 case studies. Overall results are discussed with emphasis on general accident data, vehicular factors, environmental factors, and human factors. Comments are made regarding the effectiveness of current standards. Conclusions and recommendations are presented concerning driver education programs, poor risk drivers, use of alcohol, common accident causes, side impact protection, motor vehicle inspection, roadside obstructions, motorcycle safety, police traffic services, and postcrash debris hazard control and cleanup.

Search terms: Police traffic services; Accident investigation; Accident factors; Multidisciplinary teams; Safety standards; Debris removal; Postcrash phase; Texas; Driver education; Problem drivers; Drinking drivers; Roadside hazards; Damage severity index; Occupant protection; Accident causes; Accident case reports; Environmental factors; Human factors; Driver characteristics; Accident studies; Vehicle inspection; Motorcycle safety; Injury severity index

AVAILABILITY: NTIS

the same roads at similar times, with drunken driving arrests, with other serious traffic violations, and with no crashes or citations for five years. Variables studied included alcohol use, driving patterns, and social problems. Among driver fatalities, 54% had alcohol in their blood, compared to 14% of roadblock drivers and 2% of clear record drivers. Almost all drunken drivers were male heavy drinkers with bad driving records. Discriminant function analysis classified correctly 95% of clear record drivers and 87% of drunken drivers using four variables: lifetime citations, occupational level, beer frequency, and liquor quantity. Induced intoxication experiments studied alcohol effects on driving related behavior.

Search terms: Blood alcohol levels; Alcohol effects; Alcohol usage; Driver behavior; Driver characteristics; Driver intoxication; Driver fatalities; Driver personality; Drinking drivers; Driver records; Multiple discriminate analysis; Driver occupation; Problem drivers; Driver social class; Male drivers; Accident studies

AVAILABILITY: NTIS

HS-800 601 Fld. 1/3; 4/7

INDIRECT METHODS FOR MEASURING EXPOSURE FACTORS AS RELATED TO THE INCIDENCE OF MOTOR VEHICLE TRAFFIC ACCIDENTS. FINAL REPORT

by Frank A. Haight

1971 80p 16 refs
Contract DOT-HS-1-041-1-049

Report for 1 Apr-30 Sep 1971.

The report explores the possibility of defining exposure to collisions by mathematical transformation of accident data, and gives reference to existing and proposed systems for such definition. The concept of induced exposure, based solely on accident experience, is explored.

NHTSA Contractors Reports

(Cont'd.)

HS-800 601 (Cont'd.)

Search terms: Accident statistics; Mathematical analysis; Accident risk forecasting; Equations; Statistical analysis; Mathematical models

AVAILABILITY: NTIS

HS-800 603 Fld. 1/3

PROGRAM OF INSTRUCTION FOR HIGHWAY COLLISION INVESTIGATION TRAINING PROGRAM. TRAINING SYLLABUS

by John W. Garrett; E. M. Pitcher

Cornell Aeronautical Lab., Inc.

1971 121p

Contract FH-11-7572

Report No. CAL-V5-2980-V1

This program of instruction was prepared to provide multidisciplinary accident investigation teams and others with background information, a working knowledge of all the pertinent factors, investigative techniques, tools, data requirements and field practice, to enable them to conduct an in-depth field investigation of a traffic accident, to reconstruct the accident from the data collected, to draw conclusions and recommendations from the results of the investigation, and to prepare a written report of the completed case.

Search terms: Accident investigation training; Multidisciplinary teams; Instruction manuals; Accident reconstruction; Accident causes; Accident factors

AVAILABILITY: NTIS

NHTSA Straff Speeches, Papers, etc.

HS-810 176 Fld. 4/1

STATEMENT BEFORE THE SUB-

COMMITTEE ON INVESTIGATION AND OVERSIGHT, COMMITTEE ON PUBLIC WORKS, U. S. HOUSE OF REPRESENTATIVES, MAY 20, 1971, REGARDING UNIFORM TRAFFIC CODES AND LAWS

by Douglas W. Toms; Walter J. Norbet

National Hwy. Traf. Safety Administration

1971 66p refs

An Analysis of the Traffic Codes and Laws Program Administered by the National Highway Traffic Safety Administration Under the Highway Safety Act is included.

The need for uniformity in motor vehicle and traffic laws is discussed. The Uniform Vehicle Code is a model for enactment by all states, but weaknesses in existing state laws are most common in dealing with traffic control devices, right of way, speed restrictions, stopping, parking, and motorcycle rules. Federal program standards on codes and laws are stimulating progress toward state legislative action. An analysis of the NHTSA traffic codes and laws programs under the Highway Safety Act includes a state-by-state comparison of conformity with the Uniform Vehicle Code in rules of the road articles. The work of the National Committee on Uniform Traffic Laws and Ordinances is also described.

Search terms: Uniform Vehicle Code; Law uniformity; State laws; Traffic laws; Highway Safety Act of 1966; Federal aid; Federal state relationships; Vehicle laws; National Committee on Uniform Traffic Laws and Ordinances

AVAILABILITY: NHTSA

HS-810 178 Fld. 3/6

A STATUS REPORT ON THE NATIONAL DRIVER REGISTER

by Brian J. Connell

National Hwy. Traf. Safety Administration

1971 5p

Presented at the 39th Annual AAMVA International Conference, New York, 23 Sep 1971.

Recalling defective drivers is more difficult than recalling cars, without precise identification. The register recommends driver birthplace data and social security numbers to identify drivers with certainty, but has found that these data are not generally available from the states. Alcohol safety programs rely on the register, which each day receives about 3,000 records and 65,000 inquiries and responds with 550 reports. Proposed legislation will broaden the use of the register, but the quality of the data depends on cooperation by the states.

Search terms: National Driver Register; Driver licensing; Driver identification; Federal state relationships; Problem drivers; Driver records; Social security; Drinking drivers

AVAILABILITY: NHTSA

HS-810 185 Fld. 3/11

PATTERNS OF PEDESTRIAN ACCIDENTS AND HUMAN ENGINEERING SOLUTIONS

by Monroe B. Snyder

National Hwy. Traf. Safety Administration

1971 15p 1 ref
Contract FH-11-7312

Presented at Human Factors Society annual meeting, New York, 21 Oct 1971.

This paper describes involvement patterns and human engineering solution for a number of specific types of pedestrian accidents. The type descriptions were derived from a study of over 2100 individual accident cases. The potential

solutions presented are those that appear most promising for immediate reduction in the almost 200,000 accidents to which they apply each year. Five frequent types account for over 50% of urban pedestrian accidents: darting out in traffic, usually involving children; darting across more than halfway before being struck; intersection dash; multiple threat; vehicle turn or merge with attention conflict.

Search terms: Pedestrian accidents; Accident location; Accident risks; Accident prevention; Human factors engineering; Accident types; Urban accidents; Children; Accident causes; Pedestrian behavior; Pedestrian safety

AVAILABILITY: NHTSA

HS-810 186 Fld. 3/1; 4/4

STATUS OF THE NHTSA ALCOHOL COUNTERMEASURES PROGRAM

by Robert B. Voas

National Hwy. Traf. Safety Administration

1971 32p

Prepared for presentation at Michigan State University, 22 Jul 1971.

Past alcohol safety campaigns have been losers, but the NHTSA is convinced by recent trends that traffic deaths and injuries involving alcohol can be reduced. The public is realizing that drunken driving is a major problem, as research focuses attention on the relative few who drink excessively. The expanded alcohol countermeasures program involves many countermeasures and action on: research, public education, Federal-state priority programs, and demonstration projects in selected communities, the Alcohol Safety Action Projects.

Search terms: Alcohol usage deterrents; Alcohol education; Alcohol laws; Problem drivers; Alcohol Safety Action Projects; Drinking drivers; Alcoholism; Federal state relationships

AVAILABILITY: NHTSA

NHTSA Imprints

HS-820 161 Fld. 2/0; 5/0

RESEARCH REPORTS OF THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION. A BIBLIOGRAPHY 1967-JUNE 1971

National Hwy. Traf. Safety Administration

1971 241p

Research reports listed are the products of contracts in the fields of highway and motor vehicle safety. Availability is noted; reports are indexed by corporate and personal authors, by contract, project, and report numbers, and by title keyword-in-context (KWIC) index.

Search terms: Bibliographies; Contracts; Indexes; Highway safety; Vehicle safety; National Highway Traffic Safety Administration

AVAILABILITY: NTIS



executive summary

SYNOPSIS OF A RECENTLY RELEASED NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION RESEARCH REPORT

CONSOLIDATED SYSTEM OF EMERGENCY SERVICES (PROJECT 20/20)

Purpose of the project: to develop a flexible, comprehensive methodology for evaluation and improving emergency medical service systems on the highways of the State of Nebraska, and implement a total system concept which will demonstrate the maximum use of multidisciplinary subsystem for rapid and effective response to the urgent needs of on-highway sick and injured, and to establish an emergency notification, dispatch, and assistance program for highway accident victims.

Contract FH-11-6854
State of Nebraska
Adjutant General's Department
1300 Military Road
Lincoln, Nebraska 65809

Award Amount: \$472,000
Period of contractual performance:
December 31, 1969 through
February 28, 1971

DOT/HS-800 589

General Remarks

Under terms of a research contract with the U.S. Department of Transportation, the State of Nebraska started one of the most extensive and important of these projects in April 1968. Entitled "Emergency Notification, Dispatch and Assistance for Highway Accident Victims" the contract, in line with the project proposals, called for a multidisciplinary program to enhance the quality and timeliness of emergency medical services through improved accident detection and reporting, more effective ambulance dispatch, and improved paramedic training. Actual program elements were to include highway accident surveillance service, video tape documentation and training for paramedics, computer storage and readout information presentation, a study of the air-ground ambulance companion role; vital function telemetry, and a three-dimension functional component model to provide for national visibility of the overall program.

The Program

The research program consisted of eight project elements for detailed study. Defined action agencies were assigned specific tasks. New and improved services were introduced in the project test areas. Continued field testing was conducted to determine the day and night effectiveness of the coordination techniques, the suggested improvements that resulted, and the potential for a totally integrated emergency services system. This system was one in which "Medical Care" received special improvement emphasis throughout the study. It involved multiple agency coordinated response to the accident scene requiring injury and life saving service and public safety actions.

MAJOR RESULTS, CONCLUSIONS AND RECOMMENDATIONS

For a full "Executive Summary," see page 2.

- o Nebraska Emergency Reporting System (NERS) is a voluntary highway surveillance system established for the rural areas where long distances, sparse population and transportation, and communication difficulties often exist, and where detection and notification are problems. NERS, therefore, incorporates the reporting capabilities of several existing highway reporting sources such as vehicles, Agricultural Extension Agents, Game and Park personnel, utility services, and citizens band radio volunteer groups. These groups represent another potentially valuable source of accident notification.

Conclusion: "The capacity of 911 operations in the test configuration appeared adequate for (a) receiving most of the emergency calls in the city/county area if other emergency numbers were retired, and (b) receiving most emergency calls for all of the 12 counties in the research area."

Element No. 2 Video Tape Documentation

- o The availability of light weight portable television cameras, video tape recorders provided a valuable asset in various aspects of Project 20/20 operations. The video system employed in the project provided a useful method of disseminating information, education and documentation as well as displaying salient features of the program in the model demonstration facility. Through video documentation and facilities made available by the Nebraska Education Television Network, the project was able to present its story on a Statewide basis, thus greatly increasing its exposure to the general public. As a visual aid in training programs for ambulance attendants, highway accident surveillance personnel and other individuals involved in the program, the video recorder methods proved highly useful.

Conclusions and Benefits of the Video Subsystem Exploration:

1. The development of closed circuit television Trauma Conferences in Omaha, Lincoln and Grand Island.
2. Local doctors become more aware of the problems of the ambulance attendants through these video training programs and are now recommending legislation to require training and certification of all ambulance attendants.
3. There is an increased interest in all facets of the

Element No. 3 Ambulance Attendant Training

- o High quality initial emergency medical care given at the accident site substantially reduces the possibility of permanently disabling and fatal injuries. The Ambulance Association of America estimates that 25,000 cases of permanent injury and disability result yearly from training deficiencies among ambulance attendants and other rescue workers. To meet this urgent need, AmBuCare, as the program is known, is a 36 hour special emergency care training course. It was designed and implemented to provide the training necessary to increase the first-aid on-scene and in transit capability of ambulance personnel. Certificates are awarded to personnel upon satisfactory completion.
- o The training program is a cooperative effort of the University of Nebraska College of Medicine, the State Department of Health and the American Red Cross and has engendered such enthusiasm and support that organizations outside the test areas are requesting the same training.

Conclusion: "A Statewide program of instruction and certification has emerged under the newly established emergency services division of the State Health Department.

The training of ambulance attendants was one of the most successful elements of the project, evidenced by the fact that the AmBuCare program is continuing, and that the Department of Health now sees AmBuCare as a need for the entire State and is planning to broaden the program to a Statewide operation. Three hundred and ninety-six ambulance attendants were trained in the program which is a sufficient number to assure that at least one trained attendant will go on almost every emergency ambulance run.

The true success of this program is in the number of lives saved and maiming injuries recovered as a result of the training."

Element No. 4 One County Road Equipment Test

- o The objective was to study and evaluate the effectiveness of county road graders as a part of a mobile surveillance service for the purpose of emergency detection and notification on rural roads. The communication capability between the mobile radio equipped vehicle and an emergency service facility was also observed. Emergency

Conclusion: "In the NERS county road surveillance program, such equipment as road graders and supervisors' trucks were outfitted with mobile radios. It was concluded that highway surveillance by such vehicles was highly useful in conditions after snow storms involving stranded motorists, hazardous roads, traffic control, and vehicle failures."

Element No. 5 Computer Assisted Information System

- o To provide an effective and coordinated response to an emergency a dispatcher must have instant access to information concerning the variety, capability and number of resource services and personnel available. Instantaneous knowledge of a number of response possibilities can be produced most effectively through a computer. In each of the two test areas, an Area Emergency Operations Center (AEOC) was established, manned by the State Patrol on a 24 hour basis, to provide central aid dispatch and coordinated action for emergency services. Resource inventory information, designed to identify, evaluate the code the capabilities of services contributing to life saving care in emergency response systems were programmed into the computer. When notification of an emergency is received the location of the incident is plotted on a grid map and the type of assistance required (ambulance, fire, police, etc.) is determined. Selection of the resources nearest to the scene and best equipped to handle the emergency is rapidly made through the use of the computer. An operator receives the printout and makes the telephone call necessary for the service required. The system is being studied for use as a national model.

Conclusion: None that could be identified to the specifications and goals spelled out in the overall project. It demonstrates how equipment and personnel, and the capabilities of both, are inventoried for possible use in an emergency.

Element No. 6 Comparative Analysis – Air and Ground Ambulances

- o Studies began by the University of Nebraska in 1966 to establish a pattern of design and to test the economics of ground vehicles and helicopters for transporting the sick and injured.
- o Comparative analysis of these modes of transportation was to include: organization and management, vehicles and their equipment, on-scene and in transit care procedures, response time by type of vehicle, service cost comparison, and the ground-air companion role.

Conclusion: "This element provided comparative figures only. We believe that time will see this combined air-ground service a reality."

Element No. 7 Vital Function Telemetry

- o In future emergency rescue operations, a physician won't be aboard every ground ambulance today. Medical advice will be available to all ambulances, air and ground, from a central point via telemetry, computer and the physician monitoring them. Research was conducted with the aim of ultimately developing a system which can monitor, transmit, sort and make decisions on the condition of highway accident victims.
- o The study was conducted in three phases:
 1. The design and development of equipment suitable for field use that will detect and transmit data on several physiological functions, such as heart rate, respiration, blood flow, heart beat and an indication of the blood supply to the heart derived from an electrocardiogram (ECG).
 2. The development of systems for transmitting vital body function data, which is accurate and meaningful to a physician, to a fixed central facility.
 3. Development of computer programs to monitor vital body systems.

Conclusion: "Though proven effective and economical as a new means of improving emergency care, both on the scene and enroute to the emergency facility, this element is no longer in being in Nebraska. The apparent problem, for continuation of establishment on a Statewide basis, is one of defining who is responsible for equipment on vehicles and for the interconnected transmission services necessary when a mixture of private agency or local government ambulances, facilities of services are utilized."

Element No. 8 Model Demonstrator

- o Ranking high on the list of requirements for State and local officials in establishing an emergency system, is the development of a model demonstrator. A model classroom laboratory was designed and established to display the scale of the problems and create the atmosphere in which effective and practical remedies can be found. The model demonstration room provided a place where ideas could be exposed, problems investigated, and improvements planned. It also provided an atmosphere for training individuals who are actively

participating in highway safety and emergency care services, and it provided a three dimensional component model for national visibility to the overall program.

Conclusion: None. More experience is needed.

Project 20/20, the authors believe, has made a significant contribution to the improvement of emergency medical services required for the highways of Nebraska with systems of national importance. It has established some meaningful goals by addressing itself to the task of projecting need on a total system research approach — concentrating on the highway and the home environment — attempting, through coordinated action, to expose the un-integrated, fragmented, inefficient services now being rendered. The total system approach is applicable to all emergencies, from the highways and parking lots to the cornfields — emergencies from postage stamp size to possible nuclear disasters.

There is little that can be done about the population and the mobility demands of society; however, another look at the quality and quantity of our technology and resources is in order to find some answers for public service improvement in both dollar economics and physical assistance.

Recommendations

The progressive improvement of highway emergency service systems will be fully effective only if each governmental agency is able to respond to its proper responsibilities through contributed planning to a total system which develops "coordinated team action" utilizing highly professional and competent services. The first requirement is to establish the organizational framework under which total system planning can be accomplished. It is recommended, therefore:

- o That responsibility for the planning and coordination of emergency medical programs be fixed at the executive level of the State with specific delegation of clear responsibility to an action agency.
- o That a consultant council on emergency medical services be established at the community or regional level under guidelines set by State to act as subcouncil to the Emergency Services Action Council.
- o That a broader multi-State demonstration project be conducted along similar lines to the one conducted by area in Project 20/20. A minimum of three States is recommended. In order to collect data and gain experience that can, in turn, be used for development and establishment of more meaningful standards, it is concluded that an expansion of the program would provide this projected goal. The three-State minimum area would require cross-border coordination and cooperation between States and would, therefore, establish a mutual aid base upon which standards applicable to all States could be developed and tested. Results of such a test program would be significant and would provide initial and on-going guidelines for a national program.
- o That, for future similar projects, a Federal research evaluation team be established to observe, study, and evaluate the project as it progresses, handling out-of-State inquiries on progress information.
- o That a glossary of terms be developed for the purpose of standardizing and simplifying terminology used by personnel associates with emergency functions.
- o That action be taken to standardize equipment used in conjunction with emergency medical care within all emergency service functions. (Ambulance, police, fire, wreckers, etc.)
- o That the eight elements of the "Total System" as sub-systems be allocated to specific agencies of government for Development Responsibility.
- o That the presently fragmented, uncoordinated, separate services cannot be effectively pulled together into a workable total system until specific agency responsibilities are clearly defined, either as specific or lead agency responsibilities.

That a Statewide telecommunication system development council be established to assist in the

many separate function systems to be coordinated into a total use system, which will create the capability of "mobile unit cross-talk," whereby serving the "on-road task force" of multiple services responding to a highway accident.

- Today's telecommunication technology is not the problem... the lack of organization to effectively use existing technology is!! Bottlenecks to acquire and use available "service cross-talk technology" are primarily behavioral, not technical or economical. This includes the capability of direct connections between the calling public (911) and the On-Road Task Force Service units.
- Consolidation of Federal agency programs and funding assistance for this effort become extremely important. In this regard a resolution passed by the Midwestern Governor's Conference on July 3, 1968, reflects the urgency; the resolution:

"BE IT FURTHER RESOLVED that the federal government be encouraged to (1) consolidate the multitude of separate agency programs which are now providing piecemeal assistance in the development of state communications systems, (2) reorganize such programs into a share-system approach which will meet federal and state requirements in a

systemized, economical manner, and (3) develop new programs and procedures that will permit maximum possible day-to-day usage of communications systems that are designed to meet total federal-state-local emergency needs; . . ."

- Though some very limited movement for encouraging State consolidation of communications is being displayed at regional levels of Federal government, no central directed instructions are apparent. As example, serious duplications of funding in facility construction, hardware, and planning for emergency services systems can be found in the following Federal directions or actions now providing for separate service development:

Public Law 89-564 — Highway Safety Act of 1966

Public Law 90-351 — Safe Streets and Crime Act of 1969

The opinions, findings and conclusions expressed in this summary are those of the contractor and not necessarily those of the National Highway Traffic Safety Administration.

Availability: This report is available from NTIS, order DOT/HS-800 589 in paper copy (PC) for \$6.00 or on microfiche (MF) for \$0.95.

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